AMENDMENTS TO THE SPECIFICATION

Page 1, lines 4-14

The present invention relates to an apparatus and to a method for modifying a power flow in a segment of an electric power line with multiple phase conductors. In the present text, we will refer to "phase line" to describe what is commonly known by a person skilled in the art as "phase". The apparatus and method are used for modifying the power flow in a segment of an electric power line and also ~~enable namely~~, but not exclusively, ~~to~~ de-ice an electric power line, to modify the power flow through an electric power line in a static or dynamic manner, to stabilize an electric power network, to filter harmonics of an electric power line, to absorb or dissipate power transmitted by an electric power line, or even to limit the electric current of an electric power line.

Page 3, lines 9-19

Another object of the present invention is to ~~enable a faster modification of~~ quickly modify the power flow than what is possible in the prior art. Thus, for a power line operating at 60 hertz, the modification of the power flow can be done in a period of time shorter than 8 milliseconds without waiting for the passage of the current by zero.

Another object of the present invention, which is obtained by a preferred embodiment, is to propose an apparatus and a method for modifying a power flow in a segment of an electric power line, so that ~~enable~~ a power flow of said segment is sent directly towards another segment of the electric power line.

Page 4, lines 8-18

According to the present invention, there is also provided a ~~method for modifying a power flow in a segment of an electric power line, each segment including phase lines each having n conductors electrically insulated from one another and short-~~

~~circuited at ends of the segment, the method comprising the following steps: a) providing a power unit including a power converter for converting power between first and second pairs of terminals, and an electric component connected to the second pair of terminals and capable of circulating power through the power converter, the first pair of terminals being connected in series with a least one conductor of the segment; and b) converting power between the first and second pairs of terminals by means of power converter for modifying said power flow.~~
method for modifying a power flow in a segment of an electric power line, each the segment having phase lines each having n conductors insulated from one another and short-circuited at ends of the segment, the method comprising the following steps:

Page 7, line 28 to page 8, Line 29

According to the present invention, preferably, each segment is composed of a transmission line having several phase lines onto which an apparatus according to the present invention is mounted. The line is used as a work head transformer. The converter 18 along with the electric component 24 act as an energy source or drain controllable in voltage or in current. The converter controls the phase, the amplitude and in certain cases the frequency so as to produce functions known under the English appellation "Flexible AC Transmission System" (FACTS). A FACTS ~~enables to carry~~ carries out a control of the impedance, a ~~stabilisation~~ stabilization, a filtration, a limitation of current, a braking, etc. The electric component may also fulfill the function of a storage unit when it is carried out for example by a capacitor, a battery, a fuel cell, etc. The replacement of a storage unit by an electric resistance or by a combination of a resistance and a capacitor ~~enables to~~, which extract active power. The electric resistance can be a variable resistance.

The converter 18 can consist of a simple diode bridge, thyristors or a modulator by variable width pulses (PW~~V~~M). The switches (not shown) used in the converter can be diodes, thyristors, Insulated Gate Bipolar Transistors (IGBT), Metal-Oxide

Semiconductor Field Effect Transistors (MOSFET), Metal-Oxide Semiconductor Controlled Thyristors (MCT), Gate Turn Off Semiconductors (GTO), etc. The converter 18 as well as the electric component 24 are mounted directly on the phase line A of the segment 6 without reference to the ground or to the other phases. The electric component 24 when acting as a storage unit can be a capacitor, an inductance, a battery or a fuel cell. The use of a segment of an electric power line as a coupling transformer and the use of an apparatus according to the present invention ~~enables to~~ lowers the carrying out costs of a FACTS. The segments with converters can be distributed along a transmission line. This technology offers the advantage of acting only on a portion of the transmitted power on the line. This fraction of affected power depends on the number of segments having converters and on the number of conductors with converters.

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The voltage at the terminals of the converters is proportional to the length of the segment and to the current in the phase line. The distribution of the segments with converters along an electric power line reduces the costs of the converters in addition to allowing a serial production of the converters. This distribution of the converters along an electric power line increases the reliability of the system because the loss of a converter does not affect the operation of the other converters located along the line and ~~enables to~~ the other converters continue to modify the power flow through the line with a reduced modulation envelope. Given the fact that the power units according to the present invention can be installed directly on the line, this allows a reduction of the space used on the ground. Preferably, for a segment having three phase lines, an apparatus according to the present invention acts simultaneously on the three phases. However, in certain cases, the apparatus according to the present invention could act only on one or two of the phases, for balancing one or several phases.

Page 9, line 26 to Page 10, Line 13

The present invention also ~~enables to carry out~~ provides a method for modifying power flow in a segment of an electric power line. The method comprises step a) of providing a power unit that includes a power converter 18 for converting power between the first and second pairs of terminals 20 and 22, and an electric component 24 connected to the second pair of terminals 22 and capable of circulating power through the power converter. The first pair of terminals is of course connected in series with the conductor 12 of the phase line A of the segment 6. The method also comprises step b) of converting power between the first and second pairs of terminals 20 and 22 by means of the power converter 18 for modifying said power flow in the segment 2. Preferably, the method further comprises step c) of selectively connecting and disconnecting the first pair of terminals 20 in series with the conductor 12 by means of the switch 26, in response to control signals. Preferably, in step a), n-1 power exchange units are provided, in step b), the power is converted by at least one of the n-1 power converters, and in step c), the n-1 power units are connected and disconnected by means of their switch 26 respectively to n-1 conductors of the phase line A of the segment 6.

Page 10, lines 21-28

In the present case, for safety reasons, so as to prevent that all the conductors of a same segment open simultaneously, it is important that a same switching device regroup the switches 26 associated to a same phase line. This safety switching device which prevents the simultaneous opening of all the conductors of a same phase line could be for example the one proposed in international patent application published under No. WO 00/35061 corresponding to US patent No.6,396,172 B1.

Page 11, lines 1-11

In the present case, according to the method proposed by the present invention, in step a), an additional power unit is provided for forming a set of two power units 15 and 16; in step b), the power is converted by at least one of the two power converters 18; and in step c), the two power units 15 and 16 are connected and disconnected by means of their switch 26 respectively to the two conductors 10 and 12 of the phase line A of the segment 6. It is worth noting that in the present embodiment, preferably of course, the converter 18 and the electric component 24 of the power unit 15 ~~could be omitted for simply keeping the switch 26 connected in series with the conductor 10~~ can be removed from the current flow path by closing the switch 26. The closed switch creates short circuit across the power exchange unit, and the conductor operates as though the power exchange unit is not present. The layout shown in Figure 2 could ~~enable to~~ de-ice the conductors of the phase lines of the segment 6 and to carry out FACTS functions.

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In this Figure 3, are also shown controllers 40, a supply 42, and a transceiver 44. The previously mentioned components with sensors (not shown) ~~enable to~~ control the converters 18 from a control station (not shown) so as to carry out FACTS functions for controlling the power flow in the segments 6 and 8, and as a result controlling the power flow in an electric power network. The supply 42 operates by capacitive coupling or by inductive coupling or with the help of a solar panel or a combination of these components. Of course, the controllers 40, the supply 42 and the transceiver 44 can be used with each of the embodiments shown in Figures 1 to 9. These control components, whether the controller 40, the supply 42 and the transceiver 44, ~~could be~~ is carried out by what is proposed in ~~international patent application published under No. WO 02/41459~~ US patents 6,396,172 B1 and 6,727,604 B2 (continuation in part).

The embodiment shown in Figure 3 ~~enables to carry out~~ comprises a double converter integrated to a phase line of a transmission line operating at high and very high-voltage. The active or reactive power extracted from the segment 6 is stored in the electric component 24 and injected into the segment 8 with the help of the converter 18 of the power unit 15. The phase, the voltage or current amplitude and the frequency can be controlled independently at the converter 18 of the unit 16 or at the converter 18 of the unit 15 depending on the desired effects. Normally, the terminals 20 are adapted to receive an alternating current and the terminals 22 are adapted to receive a direct current. However, it is not excluded that the terminals 22 may be adapted to receive an alternating current. The active or reactive power could also be inverted and thus travel from the segment 8 to the segment 6 through the converter 18 of the units 15 and 16. In other cases, the two converters can operate in parallel and extract or inject the power of the electric component 24 that may constitute a storage or dissipative module. The two converters and the electric component can be located in the same casings so as to reduce electromagnetic emissions and costs. The system ~~can enable to carry out~~ provides the electric network with controlling functions of static or dynamic power flow, to carry out harmonic or subharmonic filtering functions, to carry out dissipative functions, to allow the de-icing of the lines, etc. ~~The communication between the converters may be done by air or by means of~~ The converters communicate remotely or through an optical fibre.

The apparatus shown in Figure 3 can be used for carrying out a non dissipative sub-synchronous filtering. The converter 18 of the unit 16 then extracts from the segment 6 power of the subharmonic in such a way as to reduce this subharmonic and to transfer it ~~in~~ to the electric component 24 ~~carried out by~~ which, in the current embodiment, is a capacitive storage unit. The converter 18 of the unit 15 then takes this power from the electric component 24 and re-injects it at the frequency of the network in the segment 8.

The apparatus shown in Figure 3 can be installed on a bus in a junction post of several electric power lines. Thus, in the case where the segments 6 and 8 belong to

two distinct power lines, it is possible, with the apparatus shown in Figure 3, to ~~do~~ a transfer power ~~transfer~~ from one of the transmission lines to another.

Page 13, lines 20-29

Referring now to Figure 4, the switch 26 of each power unit 15 or 16 is able to connect and disconnect, for the phase line A of the corresponding segment 6 or 8, n-1 conductors ~~that are short-circuited among each other on each side of the switch~~. In the present case, the number of conductors being equal to four, three conductors are short-circuited among each other on each side of the corresponding switch. In the present case, according to the method of the present invention, in step c), the switch 26 of each power unit 15 or 16 connects and disconnects, for the phase line A of the segment 6 or 8, three conductors that are short-circuited among each other on each side of the switch.

Page 15, line 25 to page 16, line 5

In the present case, according to the method of the present invention, in step a), three additional power units 15 are provided to form the second set of three power units 15; in step b), the power is converted by at least two of the power converters 18 that belong respectively to the first and second sets and that are linked by a common electric component 24; in step c), the three power units 15 of the second set are connected and disconnected by means of their switch 26 respectively to the three conductors 11, 12 and 13 of the phase line A belonging to the segment 8. The three conductors 11, 12 and 13 of the phase line A of the segment 8 are short-circuited among each other on one side of the corresponding switches 26. Said at least two power converters ~~enable~~ provides a power flow between the segments 6 and 8.